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Stevens

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(54) **CONTRAST RATIO DETECTION AND RENDERING SYSTEM**

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CPC ***G06T 5/008*** (2013.01); ***G06T 7/11*** (2017.01); ***G06T 11/40*** (2013.01); ***G09G 3/3607*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,274,801	A	12/1993	Gordon
5,548,798	A	8/1996	King
5,982,389	A	11/1999	Guenter et al.
5,999,195	A	12/1999	Santangeli
6,064,808	A	5/2000	Kapur et al.
6,088,040	A	7/2000	Oda et al.
6,253,193	B1	6/2001	Ginter et al.
6,556,196	B1	4/2003	Blanz et al.
6,961,060	B1	11/2005	Mochizuki et al.
7,006,090	B2	2/2006	Mittring
7,403,202	B1	7/2008	Nash
7,415,152	B2	8/2008	Jiang et al.

(Continued)

FOREIGN PATENT DOCUMENTS

CN	102509272	A	6/2012
CN	103546736	A	1/2014

(Continued)

OTHER PUBLICATIONS

Anagnostopoulos et al., "Intelligent modification for the daltonization process", International Conference on Computer Vision Published in 2007 by Applied Computer Science Group of digitized paintings.

(Continued)

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(57) **ABSTRACT**

Systems and methods can automatically detect bad contrast ratios in a rendered frame of a game application. A frame in the game application can be divided into a plurality of pixel regions with each pixel regions having multiple pixels. The systems and methods can calculate luminance of the pixels in the pixel region and calculate a contrast ratio for the pixel region based on the luminance of the pixels in the pixel region. The contrast ratio of the pixel region can be used to determine whether it is sufficient to meet a threshold contrast ratio. The color of the pixel region can be automatically changed to a predefined color to indicate that contrast ratio is sufficient to meet the threshold contrast ratio.

20 Claims, 8 Drawing Sheets